64. Inverse Matrix

$3x + y - 2z = 3$
$-2x + 2y + 3z = -14$
$5x - y - 3z = 25$

$$\underset{A}{\begin{bmatrix} 3 & 1 & -2 \\ -2 & 2 & 3 \\ 5 & -1 & -3 \end{bmatrix}} \underset{X}{\begin{bmatrix} x \\ y \\ z \end{bmatrix}} = \underset{B}{\begin{bmatrix} 3 \\ -14 \\ 25 \end{bmatrix}}$$

$$X = A^{-1}B$$

$$A^{-1} = \begin{bmatrix} -3/16 & 5/16 & 7/16 \\ 9/16 & 1/16 & -5/16 \\ -1/2 & 1/2 & 1/2 \end{bmatrix}$$

$$\boxed{\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ -7 \\ 4 \end{bmatrix}}$$

65. $\begin{bmatrix} -7 & -9 \\ 4 & 5 \end{bmatrix} X + \begin{bmatrix} 3 & 4 \\ 4 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 9 \\ 6 & -6 \end{bmatrix}$

$$\underset{A}{\begin{bmatrix} -7 & -9 \\ 4 & 5 \end{bmatrix}} X = \underset{B}{\begin{bmatrix} -2 & 5 \\ 2 & -3 \end{bmatrix}} \qquad X = A^{-1}B$$

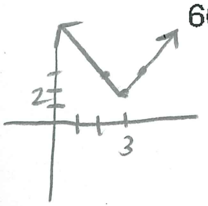
on left

$$\boxed{X = \begin{bmatrix} 8 & -2 \\ -6 & 1 \end{bmatrix}}$$

Absolute Value & Transformations

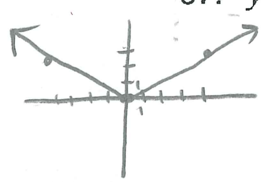
Graph and state the domain and range.

66. $y = |x-3| + 2$



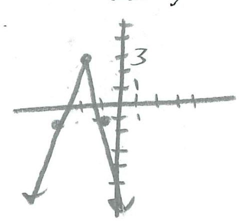
D: $\mathbb{R}$
R: $y \geq 2$

67. $y = \frac{3}{4}|x|$



D: $\mathbb{R}$
R: $y \geq 0$

68. $y = -4|x+2| + 3$



D: $\mathbb{R}$
R: $y \leq 3$

Given $f(x) = (2,0),(1,2),(-2,3),(-4,-1)$

69. $y = \frac{1}{2}f(x+2) - 3$

New Points

$(2,0) \rightarrow (0,-3)$
$(1,2) \rightarrow (-1,-2)$
$(-2,3) \rightarrow (-4,-3/2)$
$(-4,-1) \rightarrow (-6,-7/2)$

70. $y = -2f(x-3) + 1$

New Points

$(2,0) \rightarrow (5,1)$
$(1,2) \rightarrow (4,-3)$
$(-2,3) \rightarrow (1,-5)$
$(-4,-1) \rightarrow (-1,3)$

Write the absolute value function as a piecewise function.

71. $y = 2|x-2| + 4$

$$\boxed{y = \begin{cases} -2x + 8 ; & x < 2 \\ 2x ; & x \geq 2 \end{cases}}$$

72. $y = -\frac{1}{2}|x+2| - 1$

$$\boxed{y = \begin{cases} \frac{1}{2}x ; & x < -2 \\ -\frac{1}{2}x - 2 ; & x \geq -2 \end{cases}}$$

Applications

73. **Enrollment** A high school's enrollment is 950 students, which includes sophomores, juniors, and seniors. Twice the sophomore enrollment is three times the senior enrollment, and the total number of juniors and seniors enrolled is 200 more that the number of sophomores enrolled.

Use either Cramer's Rule or an inverse matrix to solve the system of equations. Show the setup of the method you choose.

x = soph
y = jun.
z = sen.

$$x + y + z = 950$$
$$2x - 3z = 0$$
$$-x + y + z = 200$$

$$A^{-1} \cdot \overset{A}{\begin{bmatrix} 1 & 1 & 1 \\ 2 & 0 & -3 \\ -1 & 1 & 1 \end{bmatrix}} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = A^{-1} \overset{B}{\begin{bmatrix} 950 \\ 0 \\ 200 \end{bmatrix}}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = A^{-1}B = \boxed{\begin{array}{cc} \begin{bmatrix} 375 \\ 325 \\ 250 \end{bmatrix} & \begin{array}{l} \text{soph} \\ \text{jun.} \\ \text{sen} \end{array} \end{array}}$$

74. From 1970 to 2002, the average yearly pineapple consumption P (in pounds) per person in the United States can be modeled by the function $P(x) = 0.0000984x^4 - 0.00712x^3 + 0.162x^2 - 1.11x + 12.3$ where x is the number of years since 1970. In what year was the pineapple consumption about 9.97 pounds?

on GC

75. A go-cart track has about 380 racers per week and charges each racer \$35 to race. The owner estimates that there will be 20 more racers per week for every \$1 reduction in the price per racer. How can the owner of the go-cart track maximize weekly revenue?

$x = \#$ of price reductions

$R(x) = (380 + 20x)(35 - 1x)$

$R(x) = -20x^2 + 320x + 13300$

$h = \frac{-320}{2(-20)} = \boxed{8 \text{ price red.}}$

$k = R(8) = \boxed{\$14{,}580.00}$

76. A campground rents campsites for \$12 per night. At this rate, al 90 campsites are usually rented. For each \$1 increase in the price per night, about 3 less suites are rented. How much should the campground charge per site to get their maximum revenue? What is the maximum revenue?

$x = \#$ of price increases

$R(x) = (12 + 1x)(90 - 3x)$

$R(x) = -3x^2 - 36x + 90x + 1080$

$R(x) = -3x^2 + 54x + 1080$

$h = \frac{-54}{2(-3)} = \frac{-54}{-6} = \boxed{9 \text{ increases}}$

$k = R(9) = \boxed{\$1{,}323.00}$

77. A package has a length 10 inches greater than its width and a height 12 inches less than its width.

a. Determine the polynomial function that will calculate the volume of a package with width *w*.

b. To carry this package onto an airplane, it cannot be larger than 4800 cubic inches. What should its dimensions be if you wan to have the maximum allowable volume?

a)

w = width

$w + 10$ = Length

$w - 12$ = height

$V = w(w+10)(w-12)$

$V = (w^2 + 10w)(w-12)$

$V = w^3 - 12w^2 + 10w^2 - 120w$

a) $\boxed{V = w^3 - 2w^2 - 120w}$

b) $4800 = w^3 - 2w^2 - 120w$

$0 = w^3 - 2w^2 - 120w - 4800$

(use calc. to find max)

78. A bottle rocket travels along a parabolic path and reaches a maximum height of 21 feet after traveling a horizontal distance of 7 feet. Write a quadratic function in any form that models the bottle rocket's path, assuming it leaves the ground at the point (0,0).

$(7, 21)$

$h = \frac{-b}{2a}$

$k = f(h)$

$y = a(x-7)^2 + 21$

$0 = a(0-7)^2 + 21$

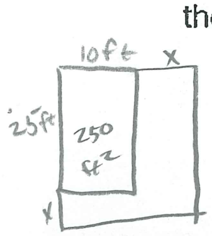
$0 = a(-7)^2 + 21$

$0 = 49a + 21$

$a = \frac{-21}{49} = \frac{-3}{7}$

$\boxed{y = \frac{-3}{7}(x-7)^2 + 21}$

79. A rectangular garden is 25 feet long by 10 feet wide. You have enough mulch to cover 1000 square feet. You would like to extend both the length and the width of the garden by *x* feet to use up all of the mulch. Write and solve an equation to represent the area of a new garden.



$(x + 25)(x + 10) = 1000$

$\boxed{x^2 + 35x + 250 = 1000}$

$x^2 + 35x - 750 = 0$

$(x + 50)(x - 15) = 0$

$x = -50$

$\boxed{x = 15 \text{ ft}}$

$\boxed{40\text{ft} \times 25\text{ft}}$